UNIVERSITY OF FLORIDA

Computer and Information Science and Engineering Department

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March 7, 2007

MEMORANDUM

TO: Cammy R. Abernathy, Associate Dean for Academic Affairs
College of Engineering

FROM: Randy Chow, Chair CISE Curriculum Committee

SUBJECT: B.S. Degree in Computer Science, College of Engineering

Per request by the Board of Governors. the total credit hours of the proposed B.S. Degree in Computer Science offered through College of Engineering has been modified from 126 to 120. This reduction of 6 credit hours is achieved by reducing 3 hours in Technical Electives (from 18 to 15) and 3 hours in Communication (from 9 to 6). The rest of the degree requirements remain unchanged as in the original proposal. The updated degree requirement sheet, a sample four-year track, and the detailed proposal are attached. Your and the Board of Governors' approval will be greatly appreciated.

Attachments:

1. Degree Requirement sheet
2. A four-year track program
3. The degree proposal

DEGREE REQUIREMENTS+
BACHELOR OF SCIENCE IN COMPUTER SCIENCE (CSE)
COLLEGE OF ENGINEERING, UNIVERSITY OF FLORIDA

GENERAL EDUCATION (18)***

Composition (ENC 3254).....3
Social and Behavioral Sciences*.....6-9
Humanities*.....6-9
International and Diversity Studies**.....6

* Both categories combined must total 15 hrs with no fewer than six hours taken in either category.
** These courses may be selected from courses that simultaneously fulfill the general education area requirement in social and behavioral science (S) and humanities (H).
*** The mathematics, physical and biological science requirements are covered by the departmental requirements below.

DEPARTMENTAL REQUIREMENTS

Mathematics (24/25)

MAC 2311	Analytic Geometry & Calculus 1	4
MAC 2312	Analytic Geometry & Calculus 2	4
MAC 2313	Analytic Geometry & Calculus 3	4
MAP 2302	Elementary Differential Equations (Cal 2)	3
MAS 3114	Comp. Linear Algebra (Cal 2 & prog. lang.exp.)	3
OR MAS 4105	Linear Algebra 1 (Cal 3)	4
STA 3032	Engineering Statistics (Cal 1)	3
COT 4501	Numerical Analysis (CIS 3020/23, MAS3114)	3

Physics (8)

PHY 2048	Physics w/Cal 1 (HS Physics, Cal 1; Cal 2, PHY2048L)	3
PHY 2048L	Lab for PHY 2048 (PHY 2048)	1
PHY 2049	Physics w/Cal 2 (PHY 2048; Cal 3, PHY 2049L)	3
PHY 2049L	Lab for PHY 2049 (PHY 2049)	1

Chemistry (4)

CHM 2045	General Chemistry (CHM 1025; or passing grade on chem. readiness exam; CHM 2045L)	3
IM 2045L	Lab for CHM 2045 (CHM 2045)	1

Communications (6)

ENC 3254	Professional Communications for Engineers	3
Writing or Public Speaking courses (advisor approval)		6

Interdisciplinary Electives (15) (choose one option)

Option A**: All credits must be applicable toward an official UF minor; completion of the minor is not required if the minor exceeds 15 credit hours, however, it is highly recommended.
***Option B*:** All courses must be at the 3000-level or above and in the same area (advisor approval required).

* If the chosen minor requires less than 15 credits, the remaining credits can be fulfilled with additional upper-division coursework in the area of the minor or with CS technical electives

Computer Science Major Courses (33)

CIS 3020	Adv Prgm Fund for CIS Majors (Cal 1, prgm exp.)	3
OR CIS 3023	Programming for CIS Majors II (CIS 3022)	3
COT 3100	App. of Discrete Structures (Cal 1, CIS 3020 or CIS 3023)	3
COP 3530	Data Struct & Algorithms (CIS 3020/23, COT 3100, Cal 2)	4
CDA 3101	Intro to Comp Organization (Cal 1, CIS 3020/23)	3
CEN 3031	Intro to Software Engineering (COP 3530)	3
COP 4600	Operating Systems (COP 3530, CDA 3101)	3
EN 4500C	Comp. Network Fund. (COP 4600)	4
S 4914	Sr. Project or CIS 4913C-IPPD 2 (4EG)	3
CIS 4301	Info & DB Sys Design & Dev 1(3020/3023, 3100)	3
EEL 3701C	Digital Logic & Computer Systems (CIS 3020/23)	4

Ethics (1)

EGN 4034	Professional Ethics (4EG)	1
CGS 3065	Legal & Social Issues in Computing	3

Technical Electives (15)**

CAP 4410	Digital Image Processing (COP 3530)	3
CAP 4621	Artificial Intelligence & Heuristics (COP 3530)	3
CAP 4680	Knowledge-Based Syst.: Theory & Pract. (CAP 4621)	3
CAP 4730	Comp. Structures in Computer Graphics (COP 3530)	3
CAP 4800	Systems Simulation (COP 3530)	3
CAP 4403	Aesthetic Computing (COP 3530)	3
CDA 4102	Computer Architecture (CDA 3101, COP 3530)	3
CEN 4012	Software System Development (CEN 3031)	3
CEN 4072	Software Testing & Verification (CEN 3031)	3
CIS 4905	Independent Study	1-4
CIS 4912C	IPPD 1 (CDA 3101, COP 3530, consent of instr.)	3
COP 4020	Programming Language Concepts (COP 3530)	3
COP 4331	Object-oriented Programming (COP 3530)	3
COP 4343	UNIX System Administration (COP 4600)	3
COP 4620	Translators & Translator Writing Sys. (COP 3530)	3
COP 4720	Info & DB System Design & Dev. 2 (CIS4301, COP 3530, S)	3
CGS 3065	Legal & Social Issues in Computing	3
EIN 4354	Engineering Economy (Jr. Standing)	3

The following courses require advisor approval in order to fulfill technical elective requirements:

CIS 4930	Special Topics (advisor approval)	3
CIS 4940	Internship (advisor approval)	1
CIS 4949	Co-op (advisor approval)	1

****CIS 3022, CGS 3460, and CGS 3464 are considered programming language courses. At most, 3 credits of a programming language course may count towards technical elective credit. See an advisor for approval**

NOTES:

- **CIS 3020 is not equivalent to CIS 3023. Any student who takes CIS 3022 must then take CIS 3023. If a student takes CIS 3022/3023 sequence, then they do not have to take CIS 3020.**
- **ENC 3254, CIS 3020, and CIS 3023 must be completed with a C or better.**
- **Courses in parenthesis are prerequisites.**
- **Underlined courses are corequisites.**
- **An Exit Interview is required during your last semester. Please see one of the department academic advisors.**
- **Students must complete all tracking courses with a C or better within two attempts (W counts as an attempt), while maintaining a 2.5 tracking GPA.**
- **Students pursuing a math minor may substitute MAD4401 for COT4501.**
- **Students who take CGS3065 as a technical elective simultaneously satisfy the ethics requirement.**

+Minimum Total Hours.....120

CURRICULUM LEADING TO THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE (CSE) COLLEGE OF ENGINEERING, UNIVERSITY OF FLORIDA

Four-Year Track

FRESHMAN YEAR

Semester 1—Fall

If you do not place out of ENC 1101, take it this semester.

MAC 2311	**Analytical Geometry & Calc 1 (GE-M)**	4
CHM 2045	**General Chemistry (GE-P)**	3
CHM 2045L	General Chemistry Lab (GE-P)	1
Humanities (GE-H)		3
Social/Behavioral Science (GE-S)		3
	Total	14

Semester 2—Spring

MAC 2312	**Analytical Geometry & Calc 2 (GE-M)**	4
PHY 2048	**Physics with Calc 1 (GE-P)**	3
PHY 2048L	Physics Lab (GE-P)	1
CIS 3022	Programming for CIS Major 1 (CISE Prgm Elective)	3
Interdisciplinary Elective		3
	Total	14

Semester 3—Summer

CIS 3023	Programming for CIS majors 2 (GE-M)	3
PHY 2049	**Physics with Calc 2 (GE-P)**	3
PHY 2049L	Physics Lab (GE-P)	1
Social/Behavioral Science (GE-S)		3
	Total	10

SOPHOMORE YEAR

Semester 4—Fall

MAC 2313	**Analytical Geometry & Calc 3 (GE-M)**	4
COT 3100	Applications of Discrete Structures	3
EEL 3701C	Digital Logic & Computer Systems	4
ENC 3254	Professional Comm. for Eng. (GE-C, GE-6)	3
	Total	14

Semester 5—Spring

MAP 2302	**Differential Equations**	3
CDA 3101	Intro to Computer Organization	3
Interdisciplinary Elective		3
Humanities (GE-H)		3
	Total	12

Semester 6—Summer

COP 3530	Data Structures & Algorithms	4
Interdisciplinary Elective		3
Humanities or Social/Behavioral Science (GE-H or GE-S)		3
	Total	10

- **Critical Tracking Criteria:**
  Critical tracking courses for semesters 1-4 appear in bold; these courses must be completed with a combined GPA of 2.5 or higher. For additional tracking requirements please refer to the College of Engineering section in the Undergraduate Catalog.

- Students with an initial course load of 15 credits or more during the Fall and Spring semesters will be permitted to drop a course without penalty provided this is done by the end of the seventh week and the total credits remaining are 12 or more. See an advisor for the summer rule.

JUNIOR YEAR

Semester 7—Fall

CIS 4301	Info & Database System Design and Dev. 1	3
Interdisciplinary Elective		3
MAS 3114	Computational Linear Algebra	
OR MAS 4105	Linear Algebra 1	3/4
STA 3032	Engineering Statistics	3
	Total	12/13

Semester 8—Spring

Communications Course		3
COT 4501	Numerical Analysis	3
Interdisciplinary Elective		3
Technical Elective		3
	Total	12

Summer Semester

Pursue Internship/Co-op if desired

SENIOR YEAR

Semester 9—Fall

COP 4600	Operating Systems	3
CEN 3031	Intro to Software Engineering	3
CGS 3065	Legal and Social Issues	3
Technical Elective		3
	Total	12

Semester 10—Spring

CEN 4500C	Computer Network Fundamentals	4
CIS 4914	Sr. Project or CIS 4913C-IPPD 2 (4EG)	3
Technical Electives		3
	Total	10

TOTAL HOURS REQUIRED FOR DEGREE 120

ACM:
For information on joining the Association for Computing Machinery, visit their web site at www.acm.cise.ufl.edu, or send e-mail to acm@cise.ufl.edu. If you would like to participate in any ongoing discussions, please subscribe to acm-discuss@cise.ufl.edu and if you are interested in receiving announcements of corporate info sessions, job/internship postings, programming competitions and upcoming speakers, please subscribe to acm-announce@cise.ufl.edu.

Honors:
In order to graduate cum laude a student must attain an upper division GPA of 3.3 or higher. A 3.5 upper division GPA is required for magna cum laude and a 3.8 for summa cum laude. In order to receive magna or summa cum laude designations a student must complete an honors project and submit a written thesis based on the research performed for that project. For more information on graduating with honors please contact Kevin Austin in CSE E405 the semester before you graduate.

CISE DEPT. WEB SITE: www.cise.ufl.edu
Please visit our web site for information about professors and course syllabi.

CISE DEPT. ADVISING WEB SITE:
www.cise.ufl.edu/students_services/
Please visit our web site for information on degree programs.

Minimum Total Hours 120

Rev 12/06

Attachment C

Florida Board of Governors

Recommended Proposal Format for New Bachelor's or Master's Degree Program

University of Florida University Submitting Proposal	**As soon as approved** Proposed Implementation Date
Engineering Name of College or School	**Computer and Information Science and Engineering** Name of Department(s)
Computer Science Academic Specialty or Field	**B.S. Computer Science CIP 11.0701** Complete Name of Degree (Include Proposed CIP Code)

The submission of this proposal constitutes a commitment by the university that, if the proposal is approved, the necessary financial commitment and the criteria for establishing new programs have been met prior to the initiation of the program.

Vice President for Academic Affairs	Date	President	Date

Indicate the dollar amounts appearing as totals for the first and the fifth years of implementation as shown in the appropriate summary columns in DCU Table Four. Provide headcount and FTE estimates of majors for years one through five. Headcount and FTE estimates should be identical to those in DCU Table Three.

	Total Estimated Costs	Projected Student Enrollment	
		Headcount	FTE
First Year of Implementation	$0	250	215
Second Year of Implementation		350	301

Third Year of Implementation		355	305
Fourth Year of Implementation		385	331
Fifth Year of Implementation	$0	430	370

Note: This outline and the questions pertaining to each section must be reproduced within the body of the proposal in order to ensure that all sections have been satisfactorily addressed.

INTRODUCTION

I. Program Description

Describe the degree program under consideration, including its level, emphases (including tracks or specializations), and the total number of credit hours.

The proposed program is a 120 credit **B.S. degree in Computer Science** to be offered in the College of Engineering. The main components of the program are

- *Engineering pre-professional courses* in mathematics and science
- *A technical core* of required courses covering essential areas in computing
- *Technical electives* allowing students to deepen their knowledge in chosen technical areas
- *Interdisciplinary electives* allowing students to gain in-depth of knowledge in any area of their choice
- *Communications, general education, and humanities*

Many valid, yet different, approaches to studying computer science are suitable for students with different goals. With our current degree programs (described below in section IIb), we already provide several. However, we currently do not provide a good option for those who want a very strong technical background in Computer Science but are not interested in a strong hardware emphasis. The proposed Computer Science degree in the College of Engineering fills this gap. The interdisciplinary electives allow this degree program to easily adapt to the increasingly interdisciplinary nature of computing and provide more flexibility for students.

READINESS

II. Institutional Mission and Strength

A. Is the proposed program listed in the current State University System Strategic Plan? How do the goals of the proposed program relate to the institutional mission statement as contained in the SUS Strategic Plan and the University Strategic Plan?

Computing and Information Science is a broad area that has been identified by SUS under the *Targeting Baccalaureate Degree Programs for Florida Workforce Enhancements* program.

The overarching goal of the University of Florida Strategic Plan is to "raise the University of Florida into the ranks of the nation's great universities." More specifically, the university plans to strengthen key disciplines in the core colleges. Engineering has been designated as a "core college" and within Engineering, Computer Science has been designated a key area. The new program will strengthen the undergraduate program in this key area.

B. How does the proposed program specifically relate to existing institutional strengths such as programs of emphasis, other academic programs and/or institutes and centers?

The current undergraduate degree offerings by the CISE department have developed over the years and are no longer optimal. Currently we offer four bachelor level programs in four differenct colleges. Theses are

BS-Computer Engineering (CEN). This is a degree offered jointly by the CISE and ECE departments in the College of Engineering and provides students with a rigorous engineering education and background in both hardware and software design. The degree offers two tracks which give students the option to specialize in either software (through CISE) or hardware (through ECE).

BS-Computer Science (CS). This degree is offered by the CISE department through the College of Liberal Arts and Sciences. This program allows students to obtain a liberal education while studying computer science. It offers students considerably more freedom than the Computer Engineering program at the expense of considerably less technical depth in computer science. This degree program is popular with students who want to double major in Computer Science and another field in CLAS such as Mathematics or Physics.

BS-Computer and Information Sciences (CIS). This degree is offered by the CISE department through the College of Business. Students receive a business-oriented education and develop skills necessary to develop software in a business environment. This program allows less depth in computing than either Computer Engineering or Computer Science degrees, while providing significant background in business and economics.

BS-Digital Arts and Sciences (DAS). This unique degree is offered by the CISE department as a joint program in the College of Engineering and the College of Fine Arts. DAS is a limited access program that provides students with a solid core education in computer science along with the flexibility to complement their program with art, music, theatre, etc. Many of the students in this program aspire to careers such as animation, video game design, or computer music.

Justification for another program Many valid, yet different, approaches to studying computer science are suitable for students with different goals. With our current degree programs, we already provide several. However, we currently do not provide a good option for those who want a very strong technical background in Computer Science but are not interested in hardware. Such students must either choose the CLAS Computer Science degree, be subjected to all the CLAS requirements such as foreign language proficiency and sacrifice considerable technical depth; or choose the Computer Engineering degree and take hardware and engineering core courses that are not of interest to the students or valued by their future employers. The lack of flexibility for students in the Computer Engineering program eliminates the opportunity for any sort of interdisciplinary focus in that program.

We propose to introduce a new degree in Computer Science offered by the College of

Engineering (EG-CS) as a first step in better meeting the needs of our students and strengthening our programs.

The new degree will

- Offer an interdisciplinary Computer Science degree with a strong, engineering oriented technical basis. Adding EG-CS to our programs will help bring our program in line of that with other leading universities, virtually all of which offer several computer science related degrees, and about half of whom offer Computer Science degrees through both an engineering and a liberal arts college.
- The new program will facilitate the development of interdisciplinary studies in Computer Science. An example of such an interdisciplinary program is Digital Arts and Sciences, a joint effort between the Colleges of Engineering and Fine Arts. This program was established as a new degree program, but this approach will be impractical to continue. In contrast, the EG-CS will offer a framework for new interdisciplinary programs that could be developed simply by defining and offering appropriate courses as technical and interdisciplinary electives.
- Compared with the current Computer Engineering degree (CEN), the proposed EG-CS degree will offer much more flexibility for the students. Instead of the electrical engineering courses required in the CEN program, EG-CS students will choose interdisciplinary electives that allow them the opportunity to acquire some depth of knowledge in virtually any field the university has to offer. This flexibility will be increasingly important in the future, as computers become important tools in an ever-increasing number of fields.
- Compared with the current Computer Science degree offered in the College of Liberal Arts and Sciences (CLAS-CS), the proposed EG-CS degree will require a significantly stronger technical background (54 computer science credits including software, hardware, and technical electives vs. 35 for the CLAS degree.) In addition, the EG-CS students will acquire essentially the same mathematics and science background as other engineering students.
- The EG-CS program is a first step towards streamlining and differentiating the various degree offerings of the CISE department. This will help to make the management of these curricula more efficient and clarify the choices for the students.

An important feature of the new degree program are the interdisciplinary electives which provide the opportunity for students to obtain some depth in virtually any area the university has to offer. We encourage students to choose a minor, but if a formal minor is not available in their area, they may create their own, subject to advisor approval.

From the point of view of the CISE department, the proposed CS program will provide an important framework for the future. The science behind computing has become so deep and information technology so pervasive that they are relevant to virtually every subject in the university. The enabling aspects of Computer Science for the Arts was recognized and let to the Digital Arts and Sciences program as a joint program between the Colleges of Engineering and Fine Arts. However, it is simply not feasible to continue to create new degree programs in every area where an interdisciplinary degree program combining computer science and another area would be desirable. Instead of creating new degree programs, we will be able to define new interdisciplinary programs as specializations of the new Computer Science degree by introducing new courses and specifying appropriate technical and interdisciplinary electives for the specialization.

C. Describe the planning process leading up to submission of this proposal. Include a chronology of activities, listing the university personnel directly involved and any external individuals who participated in planning. Provide a timetable of events for the implementation of the proposed program.

Chronology of activities.

- Fall 2002
  - Program suggested by Dean of Engineering Pramod Khargonekar to fill a gap in our curriculum and bring our offerings in line with peer institutions.
  - CISE Curriculum Committee devised draft program
  - Draft program was reviewed by the CISE Industrial Advisory Board and CISE faculty
  - Feedback from IAB and faculty incorporated into the program
  - Program approved by CISE faculty
- Spring 2003
  - Program revised in view of feedback by College of Engineering Curriculum Committee
- Spring 2004
  - Preproposal approved at university level
- Fall 2004
  - College, University, and State level approvals (anticipated)
- Spring 2005
  - Initiate program (anticipated)

University personnel and external constituencies directly involved in planning.

CISE curriculum committee
CISE faculty
CISE Industrial Advisory Board
COE curriculum committee

Timetable

The program requires no new courses for implementation and can be initiated as soon as all approvals are received. We expect the program to be implemented starting spring or fall 2005.

III. Program Quality - Reviews and Accreditation

If there have been program reviews, accreditation visits, or internal reviews in the discipline pertinent to the proposed program, or related disciplines, provide all the recommendations and summarize the institution's progress in implementing the recommendations.

The BS Computer Engineering program is accredited by ABET—the previous visit occurred in October, 2000. Since the proposed Computer Science program will share courses, faculty and facilities with the Computer Engineering program, the ABET recommendations are relevant to the new program.

There were three concerns raised by ABET during the October 2000 visit relevant to the computer engineering program, one college-wide (faculty salaries) and two for the program itself (number of faculty, and space). The following paragraphs are excerpted from the CISE 2004 Annual ABET Status Report for the Computer Engineering Program.

The ABET statement reported the following college-wide concern: Criterion 7: Institutional Support and Financial Resources. Institutional support and financial resources must be adequate to attract and retain well-qualified faculty. During the last accreditation visit at the University of Florida, it was cited that faculty salaries continue to be below national averages and professional norms. Although it is recognized that several initiatives have been enacted to correct the salary problem, it never the less still appears that faculty salaries continue to be below national averages and professional norms, especially in comparison to the University of Florida's peer institutions. The EAC recommends that measures be taken to assure that financial resources are directed to maintaining the quality and continuity of faculty in the engineering program. The CISE department chair, Sartaj Sahni, and Dean Pramod Khargonekar implemented a plan to improve the salaries of high-performance low-paid faculty. In January, 2003, 13 faculty received raises in this program. While this remains a serious concern that has not yet been resolved, the current economic climate has helped us recruit top quality faculty, and perhaps to retain more of the faculty we currently have. No further actions have taken place. Low raises, salary compression, and salary inversion remain significant issues.

The ABET statement reported the following: Criterion 5: Faculty. The faculty in CISE, supporting 776 computer engineering majors and 1660 majors total, are delivering course content in a high quality manner. The number of faculty is, however, insufficient to generate a satisfactory level of interpersonal contact with students. Students acknowledge that faculty members respond to email, but several students expressed concern that less assertive students never have the chance to get to know any faculty members to the point where they can provide proper advisement. We are addressing this problem by continuing to hire new faculty and staff. We now have three academic advisors in CISE. This year, we sought to fill three new tenure-track faculty positions. All three of them were filled, and from our top four candidates. We also had the rare opportunity to hire a cross-disciplinary candidate, which we were able to do. With the four faculty hired in 2002, the five hired in 2003, and the departure of five tenure-track faculty members over the past two years, this gives us a net gain of eight tenure-track faculty over the past two years. These four new faculty members will bring the total number of faculty in CISE to at least 36 tenured or tenure-track faculty (including appointments shared with ECE). We have an additional 7 non-tenure track faculty (visiting faculty and lecturers), 3 with PhD's.

The ABET statement reported the following: Criterion 7: Institutional Support and Financial Resources. Both CISE and ECE need additional space for labs, offices, and TA areas. The problem is especially acute in CISE where there are nearly 2000 students and yet the department has the lowest square footage per faculty in the college and the highest ratio of student credit hours per faculty member. CISE has converted valuable lab space to TA offices, and there are many cases where TAs have to share desks or do not have offices at all. Considering the heavy reliance on TA support for computing labs, it is critical to have space to support areas for student-TA interaction. Limited space was made available to the program in the form of three rooms in Weil Hall two years ago. Although this space is not highly desirable, due to its distance from the rest of the department and to its physical condition, we provided it with 14 workstations and house 22 graduate students there. This helped in the short term, but with incoming faculty, we have still had to convert additional lab space into TA and RA offices, which negatively impacts our research. This situation has gotten worse over the last year, necessitating housing RAs in laboratory space. In the medium term, some commitments have been made to increase our space. The University has built an addition onto the J. Wayne Reitz Union, into which the

Campus Book Store has moved. Now that that move is complete, CIRCA, which occupies most of the 2nd floor and some of the 5th floor of the CSE building, is slated to move into the space the book store left. Once that move is done, the CISE Department is supposed to obtain the space that CIRCA leaves behind.

IV. Curriculum

A. For all programs, provide, a sequenced course of study and list the expected specific learning outcomes and the total number of credit hours for the degree. Degree programs in the science and technology disciplines must discuss how industry-driven competencies were identified and incorporated into the curriculum, as required in FS 1001.02 (6). Also indicate the number of credit hours for the required core courses, other courses, thesis hours and the total hours for the degree.

The proposed degree has been approved by the CISE industrial advisory board to ensure that the expectations of our graduate's employers will be met by the curriculum.

The curriculum organized by topic and a sample 4 year track for the degree are given at the end of the document.

B. Describe the admission standards and graduation requirements for the program.

Admission standards are the same as other programs in the College of Engineering. Graduation requirements include successful completion of the curriculum, plus satisfaction of department and college requirements.

The College of Engineering requires a grade point average of 2.0 for all courses completed in the college as well as an overall cumulative grade point average of 2.0 in all work attempted at the university. A minimum grade of C is required in all calculus and physics course work based on a maximum of two attempts, including withdrawals. The College of Engineering has established tracking criteria for all programs. Students must fulfill the performance criteria for their programs' tracking courses. Students who are off-track will be placed on probation. Students who fail to meet the conditions of their probation may not be allowed to continue in the College of Engineering. A grade of C or better (based on a maximum of two attempts including withdrawals) is required for each tracking course. Additional requirements imposed by the Computer Science program are a minimum grade of C or higher is required in ENC 2210 and CIS 3020 and 3023. In addition, CISE requires all Computer Science students to maintain a cumulative, upper-division and department grade point average of 2.0 or higher.

All grade point averages are based on a 4.0 scale computed on the last of the maximum two attempts (including withdrawals) allowed for each course.

1. List the accreditation agencies and learned societies that would be concerned with the proposed program. Will the university seek accreditation for the program? If not, why? Provide a brief timeline for seeking accreditation, if appropriate.

Currently, the BS in Computer Engineering program at the University of Florida is accredited by the Engineering Accreditation Commission of ABET (Accreditation Board for Engineering and Technology). A different division of ABET, the Computing Accreditation Commission (CAC),

is responsible for accreditation of Computer Science programs. Accreditation of Computer Science programs, however, is much less well established than that of traditional engineering programs and many prominent programs are not accredited. (In 2003, of 30 leading Computer Science programs, only 7 were accredited.)

The proposed degree program meets the curricular requirements for CAC accreditation if we choose to pursue it. One obstacle to accreditation would be the average class size of upper division courses, which, at the University of Florida, tend to be significantly larger than the recommended 30 students. Unfortunately, because the Computer Science and Computer Engineering programs are accredited by different divisions of ABET, with different histories, and the formal aspects of meeting the requirements are different enough that the faculty workload in pursuing both would be significant. At the current time, given the small number of accredited computer science programs, we do not feel that the benefit to be derived from accreditation in addition to the accreditation of our Computer Engineering Program (which shares courses, faculty, and facilities) would be worth the cost in faculty time. This decision could be revisited at any time.

B. Provide a one or two sentence description of each required or elective course.

CAP 4410 Digital Image Process.
Credits: 3; Prereq: COP 3530 and MAC 2312, MAC 3512, or MAC 3473.
Survey of techniques used to replicate the human vision process in computer systems. Topics include image formation, image algebra, filtering, range extraction, edge and boundary detection, region growing, and model based vision.

CAP 4621 Artificial Intelligence and Heuristics.
Credits: 3; Prereq: COP 3530.
Introduction to artificial intelligence concepts. Heuristic search, clause form logic, knowledge representation, reasoning and inference, overview of computer vision, planning, natural language, Lisp and Prolog.

CAP 4680 Knowledge-Based System: Theory and Practice.
Credits: 3; Prereq: CAP 4621.
Concepts, theory and various applications for knowledge-based (expert) systems, reasoning schemes, knowledge representation, knowledge-based system tools, building knowledge bases, knowledge acquisition, reasoning under certainty and inexact reasoning.

CAP 4730 Computational Structures in Computer Graphics.
Credits: 3; Prereq: COP 3530.
A study of the major topics in computer graphics; display and output technology; two and three dimensional manipulations; space curves and surfaces; hidden surface removal and shading models.

CAP 4800 Systems Simulation.
Credits: 3; Prereq: COP 3530.
Simulation methodology and practice. Covers basic concepts in modeling and analysis for both continuous and discrete systems. Combined simulation methods including integrated qualitative/quantitative system modeling. Will use in-house simulation software.

CDA 3101 Introduction to Computer Organization.
Credits: 3; Prereq: CIS 3020 and MAC 2233, MAC 2311 or MAC 3472.
Organization of computing systems. Logical basis of computer structure. Machine representation of instructions and data, flow of control, and basic machine instructions. Assembly language programming.

CDA 4102 Computer Architecture.
Credits: 3; Prereq: CDA 3101, COP 3530.
Introduction to computer architecture and system organization including virtual memory supports cache, pipeline, vector processing, multiprocessor and RISC architecture.

CEN 3031 Introduction to Software Engineering.
Credits: 3; Prereq: COP 3530.
Topics include software planning, specifications, coding, testing and maintenance. Students gain experience in the team approach to large system development.

CEN 4012 Software System Development.
Credits: 3; Prereq: CEN 3031.
Applications of software engineering methodologies and tools in software development and maintenance. Students gain hands-on experience via software engineering group projects, including decision making, communication and presentation.

CEN 4500C Computer Network Fundamentals.
Credits: 4; Prereq: COP 3530, CDA 3101 and COP 4600.
This course covers problems in design and analysis of computer networks. While some effort focuses on low level protocols, most of the course is devoted to higher level protocols at the medium access, network and transport layers. Students should be familiar with graph theory and basic probability. .

CGS 3065 Legal and Social Issues in Computing.
Credits: 3; Prereq: Previous experience in Unix environment.
This course explores the history, the myth, the ethics, the law and the risks of computer-based technology in modern society. Emphasis will be placed on critical analysis of hypotheticals and case studies. Published material will be supplemented with on-line Internet references.

CGS 3090 Ethics on the Electronic Frontier.
Credits 1; Prereq: Previous expertise in UNIX environment. Experience with World Wide Web and Hyper-Text Markup Language.
By applying basic ethical principles, this course examines legal and ethical controversies emerging from the new technology-based, information age.

CGS 3460 Computer Programming Using C.
Credits: 3; Prereq: MAC 1147 or equivalent.
Problems related to a variety of disciplines are solved. An introduction to the basic concepts of software and hardware is provided. (M)

CGS 3464 Computer Programming Using C++.
Credits: 3; Prereq: CIS 3020.
This course provides an in-depth treatment of the C++ programming language and an introduction to Windows programming using Visual C++.

CHM 2045 General Chemistry.
Credits: 3; Prereq: MAC 1147 or its equivalent. Coreq: CHM 2045L.
The first semester of the CHM 2045-2045L-2046-2046L sequence. Stoichiometry, atomic and molecular structure, the states of matter, reaction rates and equilibria, acids and bases.

CHM 2054L General Chemistry Lab.

Credits: 1; Prereq: CHM 2040 with a grade of C or better, or the current minimum SAT Chemistry score required for CHM 2045; Coreq: CHM 2041 or 2045 or 2050.
Laboratory experiments designed to accompany CHM 2041 and 2045 and 2050

CIS 3020 Advanced Programming Fundamentals.
Credits: 3; Prereq: MAC 2233, MAC 2311 or MAC 3472.
A fast-paced introduction to computer science for students with prior programming experience. Major concepts of computer science and the process of computer programming including object-oriented programming, procedural and data abstraction, and program modularity.

CIS 3022 Programming Fundamentals for CISE Majors I

Credits: 3; Prereq: MAC 2233, MAC 2311 or MAC 3472.
The first course of a two-semester introductory sequence for students without prior programming experience. Major concepts of computer science and the process of computer programming including object-oriented programming, procedural and data abstraction, and program modularity.

CIS 3023 Programming Fundamentals for CISE Majors II
Credits: 3; Prereq:
The second course of a two-semester introductory sequence for students without prior programming experience. Major concepts of computer science and the process of computer programming including object-oriented programming, procedural and data abstraction, and program modularity.

CIS 4301 Information System Design and Development.
Credits: 3; Prereq: COP 3530.
Directed work project in utilization of information resources, particularly database management software. Topics in analysis and design of application systems through all phases of system development.

CIS 4905 Individual Study in CISE.
Credits: 1 to 4; May be repeated with change of content up to a maximum of 12 credits.
Problems in different areas of computer science.

CIS 4912C Integrated Product and Process Design I.
Credits 3; Prereq: COT3100, CDA3101, COP3530, and consent of instructor.
The first part of a two-course sequence where teams of engineering and business students partner with industry sponsors to design and build authentic products and processes. Working closely with an industry liaison engineer and a faculty coach, students gain practical experience in teamwork and communication, problem solving and engineering design, and develop leadership, management and people skills. Weekly workshop activities adapt lecture topics to individual projects. Students learn firsthand how to develop products and processes that meet customer requirements on time and within budget.

CIS 4913C Integrated Product and Process Design II.
Credits: 3; Prereq: CIS4912C.
The second part of the CIS 4912-4913 sequence.

CIS 4914 Senior Project.
Credits: 3; Prereq: Senior CISE standing, approved project proposal.
Involves completing a significant CISE-related project. Student must coordinate with the instructor and a project adviser, prepare a detailed technical report and deliver an oral presentation.

CIS 4930 Special Topics in CISE.
Credits: 1 to 4.
Topics vary. Particular computer languages such as JCL, ADA, etc., and current topics of interest in area of computer and information sciences.

CIS 4940 Practical Work.
Credits: 1 to 4.
One term practical software engineering work under industrial supervision as set forth in the College of Engineering regulations.

CIS 4949 Co-Op Work in CISE.
Credits: 1.
Practical engineering work under industrial supervision, as set forth in the College of Engineering Regulations.

COP 2121 Introduction to COBOL for CISE Majors.
Credits: 3; Prereq: MAC 2233, MAC 2311 or MAC 3472.
Techniques for business information systems programming in COBOL utilizing comprehensive facilities of the COBOL language. Business applications and examples of their solutions will be employed throughout. Topics include advanced table handling as well as sequential, random, and indexed file organizations and manipulation techniques in COBOL.

COP 3013 Survey of Programming Languages.
Credits: 1 to 3; Prereq: Familiarity with computers and some programming language.
An introduction to a specific programming language, which may vary according to section. Course may be repeated for different languages.

COP 3530 Data Structures and Algorithm.
Credits: 4; Prereq: CIS 3020, with a grade of C or better, COT 3100 and MAC 2234, MAC 2312, MAC 3512 or MAC 3473.
Algorithm development using pseudo languages, basic program structures, program design techniques, storage and manipulation of basic data structures like arrays, stacks, queues, sorting and searching and string processing. Linked linear lists. Trees and multilinked structures.

COP 3610 Survey of Operating Systems.
Credits: 1; Prereq: Familiarity with computers.
An introduction to a specific operating system interface, which may vary according to section. Course may be repeated for credit for different systems.

COP 4020 Programming Language Concepts.
Credits: 3; Prereq: COP3530.

An introduction to programming language principles, including language constructs, design goals, run-time structures, implementation techniques, and exposure to a wide variety of programming paradigms.

COP 4331 Object-oriented Programming.
Credits: 3; Prereq: COP3530.
This course discusses fundamental conceptual models for programming languages and illustrates these with specific programming languages and application problems. Specific topics include class and object models and inheritance among classes and objects and static and dynamic systems and implementations.

COP 4343 UNIX System Administration.
Credits: 3; Prereq: COP 4600.
A study of the underlying concepts and techniques employed in the installation, administration, and tuning of UNIX operating systems. Topics covered include operating system installation, simple network configuration, file backup and restore, account administration, device management, scheduling, file systems, network management, and basic system and network security.

COP 4600 Operating Systems.
Credits: 3; Prereq: COP 3530, CDA 3101, knowledge of C or Cåå recommended.
The design and implementation of various components of a modern operating system including I/O programming, interrupt handling, process and resource management, computer networks and distributed systems.

COP 4620 Translators and Translator Writing Systems.
Credits: 3; Prereq: COP 3530.
Translation of languages, scanning and parsing techniques. Translator writing systems. The implementation of a compiler.

COP 4720 Database Management Systems.
Credits: 3; Prereq: COP 3530.
Provides a conceptual understanding of database management systems in terms of the hierarchical, network and relational data models and their corresponding languages. Data modeling and analysis, database design and administration. Review of file structures and a discussion of database implementation techniques. Knowledge of at least two programming languages essential.

COT 3100 Applications of Discrete Structures.
Credits: 3; Prereq: MAC 2233, MAC 2311 or MAC 3472; Coreq: CIS3020.
Covers the mathematics of discrete events, i.e., events that involve distinct elements, finite structures of distinct elements, or finite sampled versions of continuous phenomena (such as movement).

COT 4501 Numerical Analysis: A Computational Approach.
Credits: 3; Prereq: CIS 3020 and MAS 3114.
Numerical integration, nonlinear equations, linear and nonlinear systems of equations, differential equations and interpolation.

EEL 3701C Digital Logic and Computer Systems
Credits: 4; Coreq: CGS 2425 or CIS3020 or CIS3023

An overview of logic design, algorithms, computer organization, and assembly language programming and computer engineering technology. Laboratory.

EGM 3311 Introduction to Engineering Analysis.
Credits: 3; Prereq: MAC 2313
Solution methods for first and second order ordinary differential equations. Applications to radioactive decay, mass spring systems and electric circuits. Treatment of the Bessel and Legendre equations. Laplace transform methods applied to constant coefficient equations. Solution of simultaneous first order equations.

EGN 4034 Professional Ethics
Credits: 1; Junior standing
Provides students with an interactive study of ethical, theory and the development of professionalism. Students review case studies of ethical conflicts in engineering practice. Course covers engineering codes of ethics and requires students to resolve theoretical situations through application of ethical codes.

EIN4354 Engineering Economy
Credits: 3; Prereq: upper division classification in engineering
Basic principles and applications of economic decision-making between alternatives encountered in engineering systems projects. The analysis will include methodologies of economics and finance in addition to engineering fundamentals.

ENC 2210 Technical Writing.
Credits: 3 Prereq: ENC 1101 or test score equivalency.
A survey of the forms and methods of communication used in business, industry and government, including nonformal and formal reports, letters, resumes and proposals.

MAC 2311 Analytic Geometry and Calculus 1.
Credits: 4 Prereq: Passing score on placement test.
Introduction to analytic geometry; limits; continuity; differentiation of algebraic and trigonometric functions, differentials; introduction to integration and the fundamental theorem of calculus. (M) (Credit will be given for at most one of MAC 2311 and MAC 3472.)

MAC 2312 Analytic Geometry and Calculus 2.
Credits: 4 Prereq: MAC 2311 or MAC 3472. Techniques of integration; applications of integration; differentiation and integration of inverse trigonometric, exponential and logarithmic functions; sequences and series. (Credit will be given for at most one of MAC 2312, MAC 3512, and MAC 3473.)

MAC 2313 Analytic Geometry and Calculus 3.
Credits: 4 Prereq: MAC 2312 or MAC 3512 or MAC 3473.
Solid analytic geometry; vectors; partial derivatives; multiple integrals. (Credit will be given for at most one of MAC 2313 and MAC 3474.)

MAD 4401 Introduction to Numerical Analysis
Credits: 3; Prereq: experience with a scientific programming language, and a grade of C or better in MAS 4105 or in MAS 3114

Numerical integration, nonlinear equations, linear and non-linear systems of equations, differential equations, and interpolation.

MAP 2302 Elementary Differential Equations.
Credits: 3 Prereq: MAC 2312 or MAC 3512 or MAC 3473.
First order differential equations, theory of linear differential equations, solution of linear equations with constant coefficients, the Laplace transform, solution of equation by the Laplace transform.

MAS 3114 Computational Linear Algebra.
Credits: 3 Prereq: MAC 2312 (or MAC 3512 or MAC 3473) and a scientific programming language.
Linear equations, matrices and determinants. Vector spaces and linear transformations. Inner products and eigenvalues. This course emphasizes computational aspects of linear algebra.

PHY 2049 Physics with Calculus 1.
Credits: 3; Prereq: High-school physics or PHY 2020 or equivalent, and MAC 2311; Coreq: MAC 2312.
The first of a two-semester sequence of physics for scientists and engineers. The course covers Newtonian mechanics and includes motion, vectors, Newton's laws, work and conservation of energy, systems of particles, collisions, equilibrium, oscillations and waves. One hour per week is devoted to problem solving and discussion.

PHY 2048L Laboratory for PHY 2048.
Credits: 1 Coreq: PHY 2048 or equivalent.
Laboratory experiments for students in PHY 2048.

PHY 2049 Physics with Calculus 2.
Credits: 3 Prereq: PHY 2048 and MAC 2312; Coreq: MAC 2313.
The second of a two-semester sequence of physics for scientists and engineers. Content includes Coulomb's law, electric fields and potentials, capacitance, currents and circuits, Ampere's law, Faraday's law, inductance, Maxwell's equations, electromagnetic waves, ray optics, interference and diffraction. One hour per week is devoted to problem solving and discussion.

PHY 2049L Laboratory for PHY 2049.
Credits: 1 Coreq: PHY 2049 or equivalent.
Laboratory experiments for students in PHY 2049.

STA 3032 Engineering Statistics
Credits: 3; Prereq: MAC 2311
A survey of the basic concepts in probability and statistics with engineering applications. Topics include probability, discrete and continuous random variables, estimation, hypothesis testing, and linear and multiple regression

STA 4321 Mathematical Statistics 1
Credits: 3; Prereq: MAC 2313 or equivalent
Introduction to the theory of probability, counting rules, conditional probability, independence, additive and multiplicative laws, Bayes Rule. Discrete and continuous random variables, their distributions, moments, moment generating functions. Multivariate probability distributions, independence, covariance. Distributions of functions of random variables